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DEVELOPMENT OF PROCESS TECHNOLOGY FOR MAKING DAHI POWDER

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ABSTRACT

Dahi or curd is the most popular indigenous fermented dairy product, which has the short storage life under ambient conditions. The storage life of dahi can be improved by removal of moisture from it. The removal of moisture technology can be applied to dahi to make dahi powder. Dahi was dried in tray dryer at different drying temperatures i.e. 50°C, 60°C& 70°C. After drying, the dried dahi was converted to power and it was in air tight polyethylene bags. The prepared dahi powder was analyzed for moisture content, protein content, lactic acid content, bulk density, pH and ash content. The protein content of the powder was found more at 50°C drying temperature compared to the 60°C& 70°C drying temperatures. Titratable acidity and pH values of powder at 50°C were observed nearer to values of fresh Dahi. Highest overall acceptability scores were observed for Dahi powder prepared at 50°C drying temperature. Drying temperature of 50°C for 2 h is considered as optimum processing conditions for making Dahi powder. Finally buttermilk is prepared from Dahi powder at mix ratio of 1: 4 (Dahi powder: Water).

KEYWORDS: Dahi, Drying Temperatures, Dahi Powder, Butter Milk

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Original Article

INTRODUCTION

Dahi or curd is the most popular indigenous fermented dairy product. The Prevention of Food Adulteration Act describe as a product obtained from pasteurized or boiled milk by souring (natural or otherwise), using harmless lactic acid or other bacterial cultures. Dahi has a short shelf life, i.e., about one or two days under ambient conditions and not more than a week under refrigerated conditions. It is susceptible to yeast and mold spoilage. Besides the limited keeping quality of Dahi, the maintenance and propagation of Dahi culture, packaging and transport of Dahi in semi solid form are other problems faced by the dairy industry. Among the various methods of preservation, drying is the most widely used process. The technology of drying can be applied to dahi as well for improving its shelf life. Removal of moisture from dahi and conversion into powder will not only increase its shelf life but also results in reduction of packaging, transportation and storage costs because of reduction in bulk. The dahi powder can be used as a base for the formulation of health drinks, energy drinks, food fortification, military drink and in the preparation of drinks while travelling and nutraceuticals (Routray and Mishra).

Mishra and shiby (2007) was studied the drying characteristics of the dahi produced by recirculatory convective air drying and he investigated drying characteristics of dahi under varying conditions of dahi thickness (3mm, 4mm and 5mm). The yogurt powder can be produced by freeze-drying method. Freeze-drying method disadvantage is high cost of application (Sakin, 2009). The yogurt powder production by using foam-mat drying

method (Wunwisa and Bhatia, 2012), concluded that 60°C is the optimum drying temperature. From the literature, it is clear that the work reported on making dahi powder using tray dryer is limited. Further, the literature reported are measure the physicochemical properties of dahi powder. Therefore the research was conducted to develop a technology for produce Dahi powder by using the tray dryer at different drying temperatures i.e. 50°C, 60°C and 70°C and study the physicochemical properties of dahi powder and find out the optimum ratio of water to dahi powder for making buttermilk

MATERIALS AND METHODS

Preparation of Dahi Powder

One liter of Double toned homogenized and pasteurized milk was heated to 80°C for 15 min stove and then cooled to around 45°C and then inoculated with two per cent Lactobacillus culture and kept for incubation at 40±1°C for 3 h in incubator.

The prepared Dahi has been fluidized by churning process for easy spreading on the aluminum trays of tray drier, which are covered with polyethylene paper (40µ) and the trays are then placed in the hot air cabinet dryer for drying at a temperature of 50^{o}C for the first sample and 60^{o}C for second sample and 70°C for third sample. Drying is continued till weight reduction is found constant and the drying times are recorded. The instant when the sample attains a constant weight reduction, was taken as completion of drying process and respective drying times are recorded. After drying the trays were removed from the cabinet and the thin formed flakes were collected. The collected flakes were grounded to make the fine powder. The experiment is repeated thrice and average values are reported.

Determination of Physicochemical Properties

Physicochemical analysis is very much important to assess the quality of Dahi powder and to evaluate relative changes in physical and chemical composition of final product during drying of Dahi. The various physicochemical properties viz., moisture content, pH, bulk density, Titratable acidity, ash content and protein contents were carried out by adopting standard methods.

The moisture content of the fresh Dahi and Dahi powder was determined by oven drying at 100°C ± 2°C for 2 h (Ranganna, 1986). The pH of Dahi powder was determined by using a digital pH meter and the pH meter was standardized with double distilled water of pH 7.0. Acidity was determined as per International Dairy Federation (1991) standards. A standard procedure was followed for the calculation of density of Dahi powder. The protein content in fresh Dahi and Dahi powder was determined as per the method described by Lowry 1951. Ash content of the fresh Dahi and Dahi powder was determined by oven drying at 550°C for 6 h (Ranganna, 1986). Organoleptic quality of Dahi drink and Dahi powder was determined with the help of a 10 member consumer panel using a 9-point hedonic scale.

RESULTS AND DISCUSSIONS

Moisture Loss of Dahi at Different Temperatures

The initial moisture content of the Dahi is 86.3%, After drying the Dahi at different temperatures i.e. 50^{o}C, 60^{o}C and 70°C, the moisture content of dried dahi i.e., Dahi powder is 5.32%, 4.46% and 3.21% respectively. Figure 1 shows the variations of moisture content with drying time at different drying temperatures. The rate of moisture reduction was slower at 50°C compared to 60°C and 70°C. In the three cases, the loss of moisture was higher in the initial period of drying and the drying rate decreased during the later stages of drying.

Table 1: Values of Moisture Content, pH, Bulk Density, Protein Content, Lactic Acid and Ash Content of Dahi Powder Samples at Different Temperatures of Drying

S. No	Particulars	Physicochemical properties					
		Moisture Content (wb %)	pH	Bulk density (g/cm³)	Protein Content (%)	Lactic Acid (%)	Ash Content (%)
1	Fresh dahi	86.30	4.50	1.210	2.80	0.690	0.70
2	Dahi powder (at 50°C)	5.32	4.39	0.478	1.48	0.770	4.4
3	Dahi powder (at 60°C)	4.46	4.21	0.492	1.19	0.846	4.4
4	Dahi powder (at 70°C)	3.21	4.07	0.515	1.08	0.972	4.4

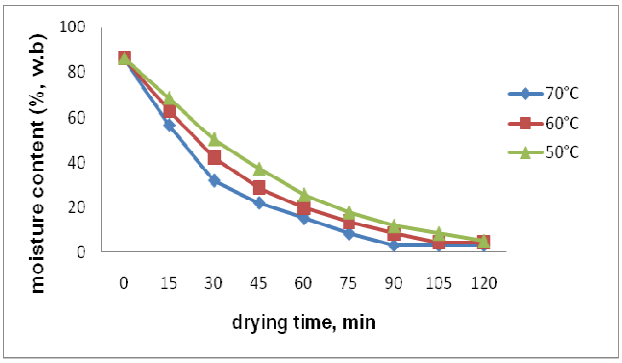

Figure 1: Moisture Loss of Dahi at Different Drying Air Temperatures

P^H of Dahi Powder

The pH of dahi powder decreased with increase in drying air temperature. The pH of fresh Dahi was found to be 4.5 while that for Dahi powder at 50°C, 60°C & 70°C was 4.39, 4.21 and 4.07 respectively. As the lactic acid increases due to increase in temperature, the pH value decreased. The pH of Dahi and Dahi powder obtained at different temperatures are shown in Figure 2.

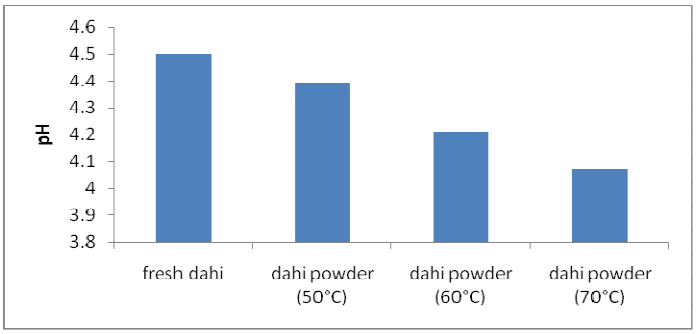

Figure 2: PH of Fresh Dahi and Dahi Powder Prepared at Different Drying Air Temperatures

Bulk Density of Dahi Powder

The bulk density at different air temperatures (50 ^{0}C, 60 ^{0}C & 70 ^{0}C) were found to be 0.478 g/cc, 0.492 g/cc and 0.515 g/cc, respectively. It is observed that the bulk density of the Dahi powder increased with increase in drying air temperature. The increase in bulk density may be due to the decrease in moisture content.

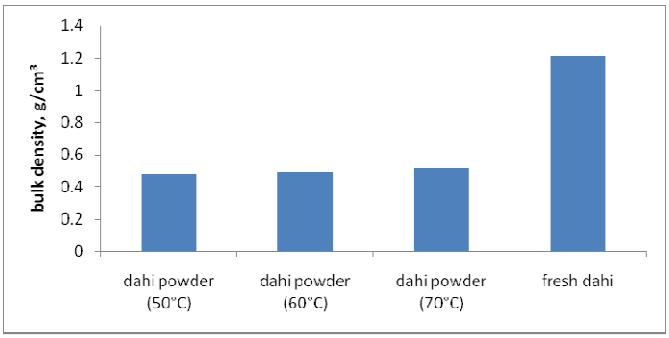

Figure 3: Bulk Density of Fresh Dahi and Dahi Powder Prepared at Different Drying Air Temperatures

Protein Content of Dahi Powder

Fresh dahi contained 2.8% proteins while dahi powder at 50^{o}C, 60^{o}C and 70^{o}C, it was found to be 1.48%, 1.19%and 1.08% respectively. The protein content in dahi powder decreased to 1.48 % at 50°C as compared to fresh dahi (2.8%). This is due to the reason that the moisture was lost during drying of the dahi, where water soluble proteins were evaporated along with the moisture. Protein contents observed at 60^{o}C and 70^{o}C were 1.19% and 1.08% respectively. Hence, the proteins present in dried Dahi at 50°C are more compared to 60^{o}C and 70^{o}C. The figure 4 shows the protein content of fresh Dahi and dahi powder prepared at different drying air temperatures.

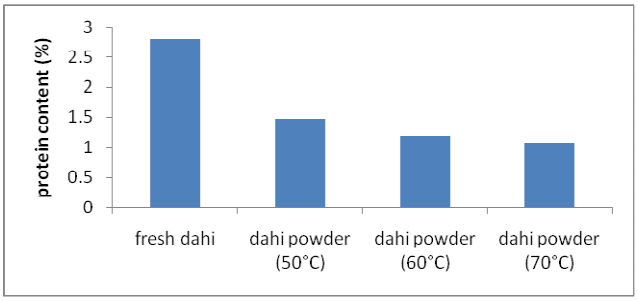

Figure 4: Protein Content of Fresh Dahi and Dahi Powder Prepared at Different Drying Air Temperatures

Lactic Acid Content of Dahi Powder

The lactic acid in fresh dahi and dahi powder at 50^{o}C, 60^{o}C&70^{o}C were found to be 0.69%, 0.77%, 0.846%, 0.972% respectively. The lactic acid content in dahi powder was found to be more than in fresh dahi. The titratable acidity (% lactic acid) increased with increase in air temperature. The increase in lactic acid content is due to action of lactobacillus bacteria in producing lactic acid with increase in temperature. The dahi, placed at higher temperatures, gets spoiled faster because of increased acidity. The lactic acid content of fresh dahi and dahi powder prepared at different drying air temperatures is shown in Figure 5.

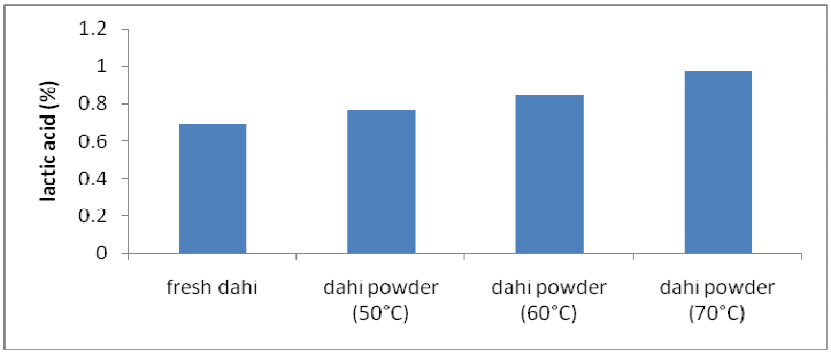

Figure 5: Lactic Acid Content of Fresh Dahi and Dahi Powder Prepared at Different Drying Air Temperatures

Ash Content of Dahi Powder

The values of ash content in fresh dahi and dried dahi powder at 50^{o}C, 60^{o}C and 70^{o}C were recorded as 0.7, 4.4, 4.4 and 4.4% respectively. However, when compared to fresh dahi (0.7%), the ash content in dahi powders is found increased (4.4%) as the concentration of solids increased due to drying. The drying temperature does not have any effect on the ash content of the dahi powders, which is 4.4%. The values of Ash content shows in table 1.

Optimum quantities of water and dahi powder for making butter milk

The dahi powder is mixed with different quantities of water for determination of optimum ratio of dahi powder to water for making dahi drink (butter milk) and the product is distributed to different panelists and as per their score the ratio containing 1: 4 mix (i.e. one part of dahi powder with four parts of water) is liked by the panelists, therefore, 1: 4 mix ratio may be taken as optimum ratio for making dahi drink (butter milk). The highest scores recorded against taste, appearance are 7.3 and 7.1 respectively Table 2.

Table 2: Average Sensory Scores of Butter Milk Prepared from Different Ratio of Dahi Powder to Water

Attribute	1:3 mix	1:4 mix	1:5 mix
Appearance	6.8	7.3	7.1
Taste	7.0	7.1	6.9
Overall acceptability	6.9	7.2	7.0

CONCLUSIONS

The optimum drying temperature for producing dahi powder is 50^{o}C for 2 h. The powder prepared at 50^{o}C contained optimum moisture content of 5.3% (w. b), Bulk density 0.478 g/cc, pH of 4.39, Lactic acid of 0.77% which near to the fresh dahi and ash content of 4.4%. Dahi powder produced at 50^{o}C contained more proteins compared to other temperatures i.e. 60^{o}C and 70^{o}C. Highest overall acceptability values were 7.2, observed for Dahi powder prepared at 50°C drying temperature than other temperatures. The prepared Dahi powder is mixed with water in the ratio of 15g: 60g (Dahi powder: water) for dahi drink (Buttermilk) making.

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